United States Patent [19]

Grantom

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[54] **PIPE SUPPORTING DEVICE**

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[51] **Int. Cl.**[4] **E21B 19/10**

[52] **U.S. Cl.** **166/75.1;** 175/423; 188/67; 269/179; 269/181; 269/208; 269/902

[58] **Field of Search** 175/423; 166/75.1, 85, 166/82, 84, 96, 76, 384, 385; 269/179, 902, 208, 287, 180, 181; 248/74.1, 316.4, 316.1, 56, 58; 188/67

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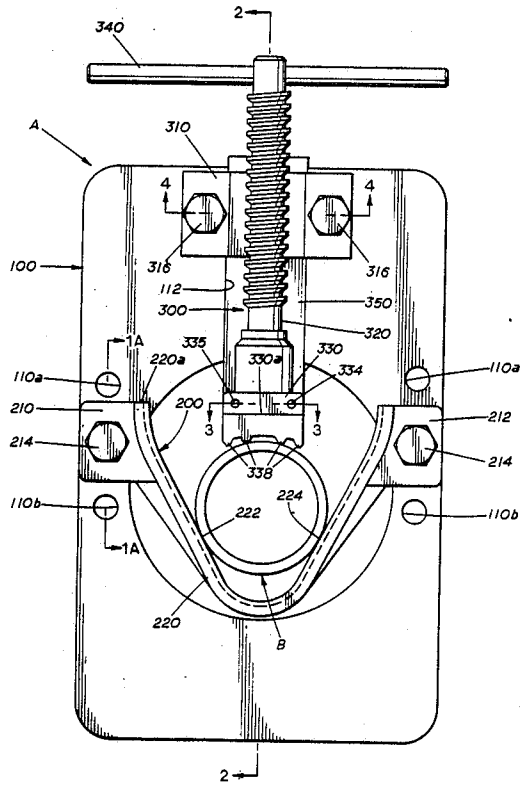
Attorney, Agent, or Firm—Pravel, Gambrell, Hewitt, Kimball & Krieger

[57] **ABSTRACT**

A device for the support of elongate members, such as tubing in a well bore, by a stationary gripping jaw and a movable gripping jaw. The movable gripping jaw is moved by a threaded shaft which pivots about one end into and out of engagement with a partially threaded nut to facilitate rapid movement of the movable gripping jaw relative to the stationary gripping jaw while maintaining the movable gripping jaw substantially vertical at all times. The stationary gripping jaw may be selectively positioned to accommodate a range of selected tubing sizes.

2 Claims, 3 Drawing Sheets



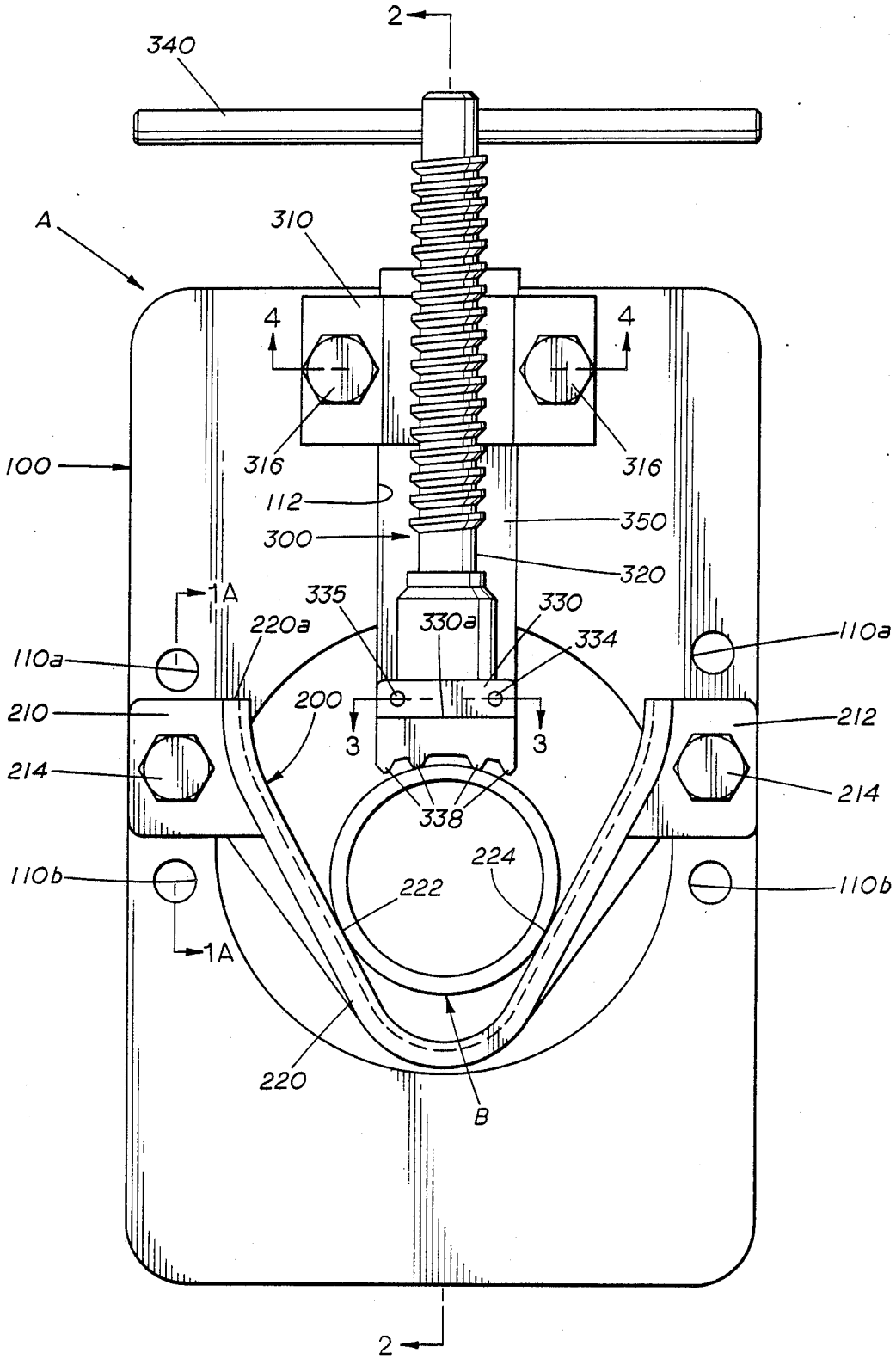

2
340
A
310
4
4
316
316
100
112
350
300
320
1A
335
330a
330
334
220a
110a
110a
210
200
212
3
3
214
214
338
224
110b
222
110b
1A
220
B
2

FIG.1

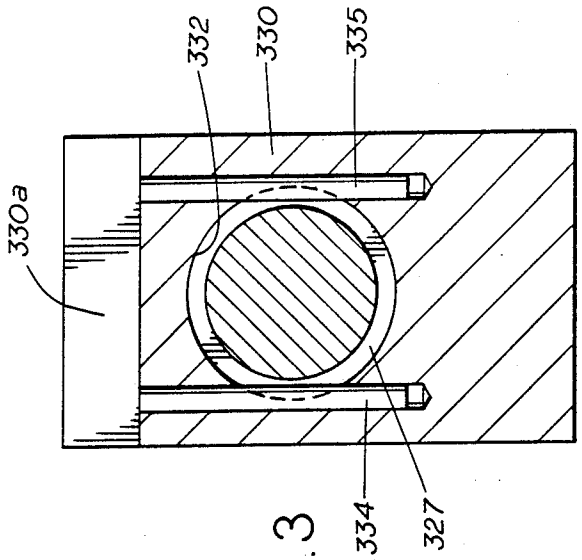


FIG. 3

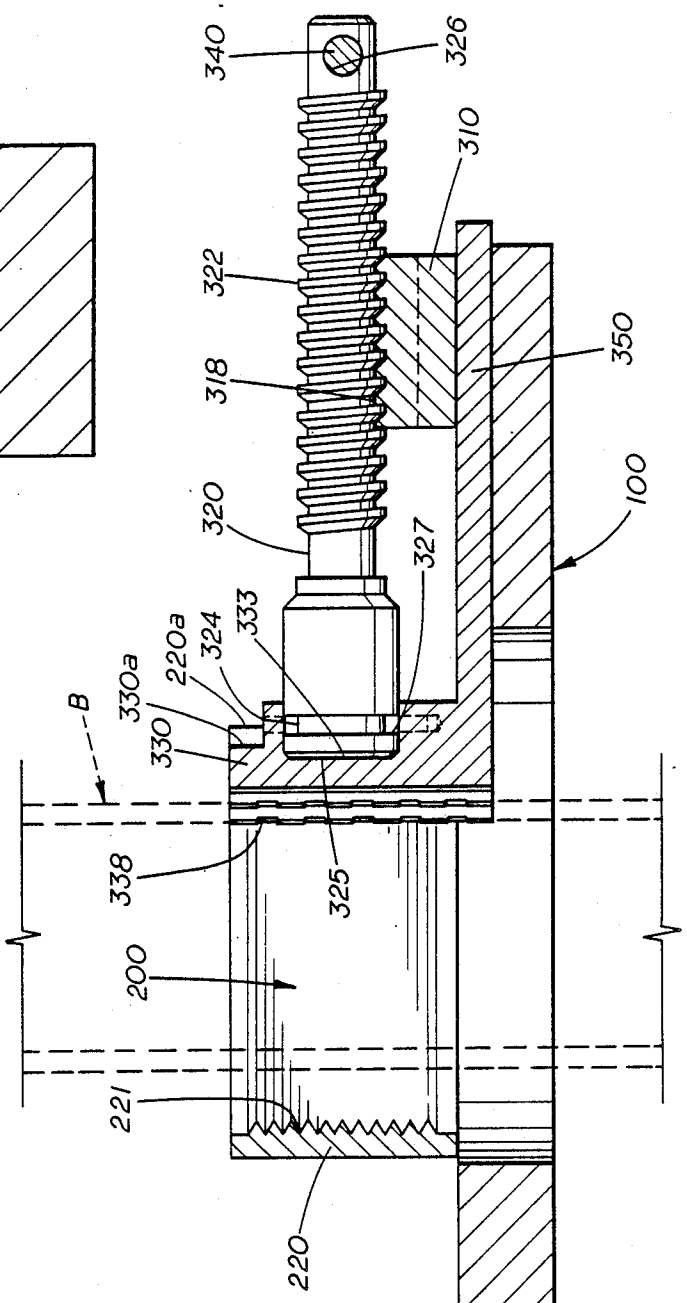


FIG. 2

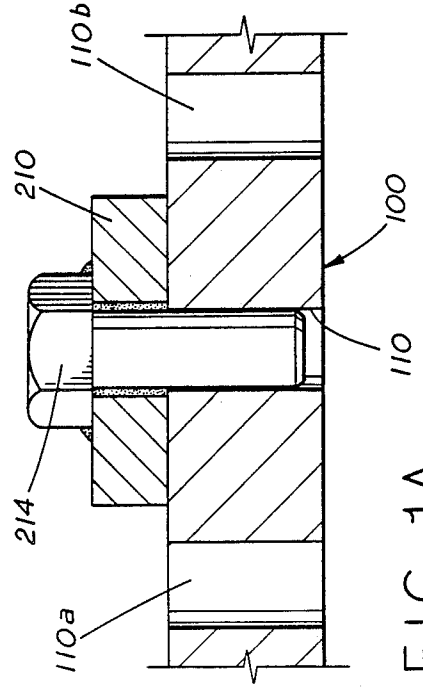


FIG. 1A

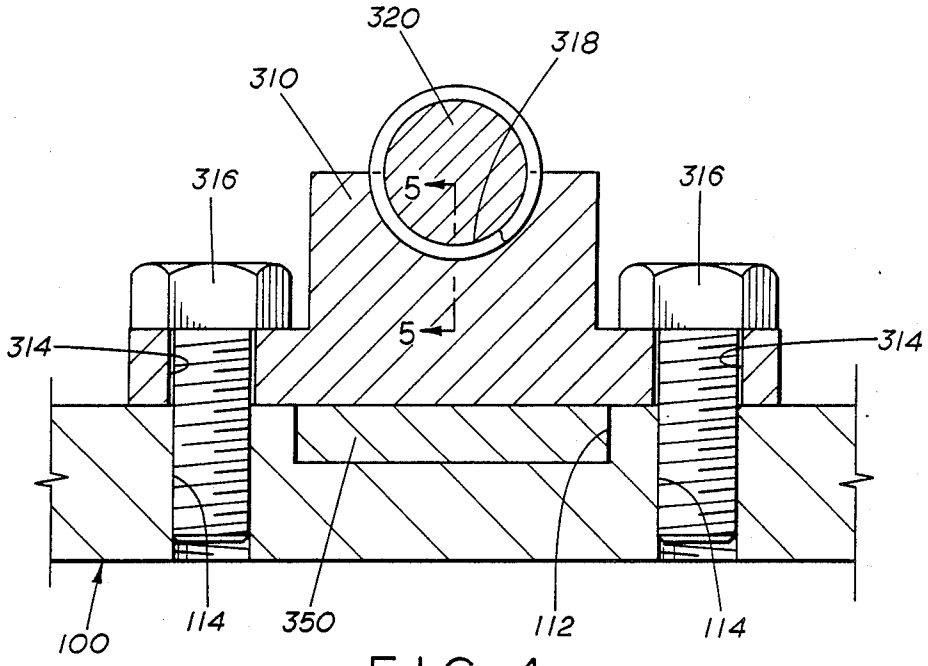

320
318
310
316
316
5
5
314
314
100
114
350
112
114

FIG. 4

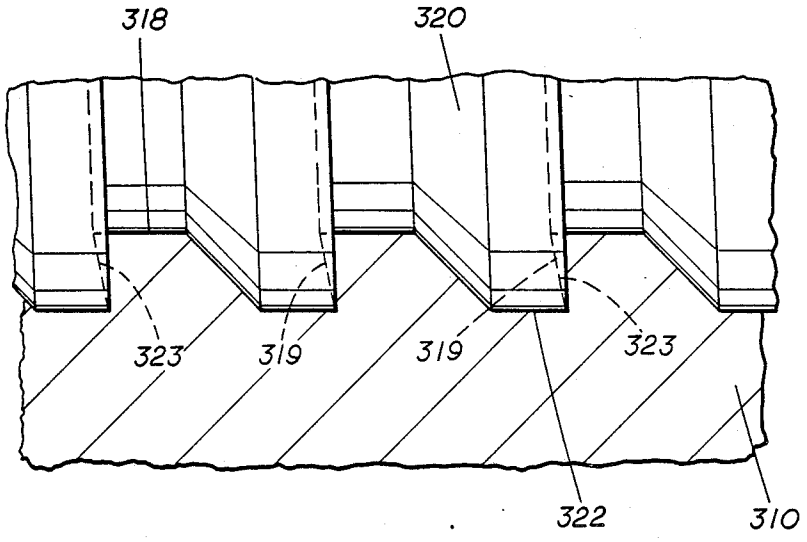

318
320
323
319
319
323
322
310

FIG. 5

PIPE SUPPORTING DEVICE

FIELD OF THE INVENTION

The field of the invention includes devices for supporting pipes, rods, or other elongate members in a vertical position. Typically such elongate members are used in supporting tubing in a well bore.

DESCRIPTION OF THE PRIOR ART

Various devices for supporting tubing and the like have been used and known for many years. Examples of such prior art are found in U.S. Pat. Nos. 326,380; 416,903; 595,309; and 769,905. Devices having means for relocating one or more of the gripping jaws to accommodate different sizes of pipe or rod are also in the prior art. See, for example, U.S. Pat. Nos. 906,505; 1,041,762; and 2,854,216.

A relatively complicated means for providing quick adjustment of the gripping member is disclosed in U.S. Pat. No. 3,492,886.

It is an objective of this invention to provide a single device which is adjustable to a selected range of different pipe diameters, and which also has a relatively simple and efficient quick-acting means for the adjustment of the locking jaw, to thereby achieve durability and low repair costs.

SUMMARY OF THE INVENTION

The invention provides a device which has a stationary jaw capable of gripping pipe of a selected range of different diameters by virtue of its substantially V-shaped internal contour and by virtue of being relocatable with respect to a movable gripping jaw. The movable gripping jaw moves only in a linear mode and is positioned and tightened into place by use of a threaded shaft which pivots to disengage it from matching threads in a half-nut, while maintaining the movable gripping jaw in a substantially vertical position so as to provide at least four point contact areas on the pipe by two gripping faces on the stationary gripping jaw and the gripping face on the movable jaw, regardless of the relative positions of the jaws to each other.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a plan view of the preferred embodiment of the invention.

FIG. **1A** is a partial section view taken on line **1A-1A** of FIG. **1**.

FIG. **2** is a sectional view of the preferred embodiment of the invention.

FIG. **3** is a sectional view of the gripping head of the invention taken on line **3—3** of FIG. **1**.

FIG. **4** is a sectional view of the threaded block of the invention, taken on line **4—4** of FIG. **1**.

FIG. **5** is a sectional view of the threaded shaft and block of the invention taken on line **5—5** of FIG. **4**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The figures in the drawings will now be referred to in giving a detailed description of the preferred embodiment.

Referring now to FIG. **1**, the device of the invention is generally indicated as A. The elongate member being gripped, such as a pipe, is indicated as B. Base plate **100** is firmly supported by and attached to a well platform not shown. Mounted on base plate **100** is stationary jaw

200. Pins **214** which are permanently attached to jaw **200** by welding or otherwise extend downwardly from the lower surface of jaw **200**. Pins **214** are removably inserted in a pair of oppositely disposed holes such as **110*a***, **110*b*** in base plate **100** according to the diameter of the pipe to be supported. For example, the pair of holes **110*a*** might be used for a pipe of **2** inch diameter, while the intermediate holes **110** through which the bolts **214** extend as shown in FIG. **1A**. might be used for a pipe of **4** inch diameter, and the holes **110*b*** might be used for a pipe of **6** inch diameter. The diameter of each of the pins **214** is slightly smaller than the diameter of each hole **110** so that the pins **214** slide in and out of holes **110** and are thus removably mounted on the base **100**. Pins **214** are permanently attached to ears **210** and **212** of jaw **200**, such as by welding. Ears **210** and **212** are connected by a substantially V-shaped truss **220**. V-shaped truss **220** is contoured so as to contact pipe B at areas **222** and **224** separated by approximately 120° on the circumference of pipe B. The contour of truss **220** is such that this approximate 120° separation of the contact points will be maintained regardless of the diameter of pipe being supported in the three positions of the truss **220** referred to above. As seen in FIG. **2**, the interior surface of truss **220** has horizontal serrations **221** which can be coated with plastic or other soft material to minimize scratching or damage to the surface of the supported pipe.

Referring again to FIG. **1**, gripping jaw **300** is comprised basically of threaded block **310**, threaded shaft **320**, and gripping head **330**. Threaded block **310** is mounted to base plate **100** by means of bolts **316** which extend through block **310** and thread into base plate **100**.

As seen in FIG. **4**, threaded block **310** has half threads **318** which can mesh with the threads around one-half the circumference of threaded shaft **320**. Bolts **316** extend through smooth bore holes **314** and are threaded into threaded holes **114** in base plate **100**. Channel **112** is provided in base plate **100** to aid in maintaining the alignment of gripping head **330** as will be discussed later.

Referring now to FIG. **2**, gripping head **330** is pressed against the perimeter of pipe B. Gripping head **330** is urged toward pipe B by threaded shaft **320** which has threads **322** which mesh with threads **318** of threaded block **310**. Bar **350** is securely attached to gripping head **330** at one end and it extends from this attachment point substantially perpendicular to the axis of pipe B through channel **112** in base plate **100**. Threaded shaft **320** is turned by means of handle **340** which passes through hole **326** in the end of threaded shaft **320** opposite the end which contacts gripping head **330**. As shown in FIG. **5**, threads **318** and **322** are undercut at surfaces **319** and **323**, respectively, to aid in keeping the threads fully meshed.

Referring now to FIGS. **2** and **3**, near the end of threaded shaft **320** which contacts gripping head **330** is annular groove **324**. Extending from gripping head **330** into annular groove **324** are retaining pins **334** and **335**. The upper surface of gripping head **330** can have a transverse notch on its rear corner to facilitate insertion of pins **334** and **335**. The vertical face of this transverse notch is shown as surface **330*a***. The far corner **220*a*** of V-shaped truss **220** is seen in FIG. **2** jutting past surface **330*a***. Retaining pins **334** and **335** prevent threaded shaft **320** from disengaging from gripping head **330** but, because they extend into annular groove **324**, they do not

interfere with rotation of threaded shaft **320** relative to gripping head **330**. Annular groove **324** is of sufficient width and is properly placed to allow threaded shaft **320** to completely enter gripping head **330** until end surface **325** of threaded shaft **320** contacts interior surface **333** of gripping head **330**. Therefore, when gripping head **330** is tightened against pipe B, force is transmitted directly from the end of threaded shaft **320** to gripping head **330** rather than applying force on pins **334** and **335**.

Referring now to FIG. **2**, annular groove **324** is of sufficient width to allow threaded shaft **320** to pivot in the counterclockwise direction as seen in FIG. **2** about pins **334** and **335**.

The operation of the device will now be described. Referring to FIG. **2**, before the insertion of pipe B, threaded shaft **320** lies engaged with threads **318** in threaded half-nut block **310**. After pipe B is inserted in the device, in the interior of stationary gripping jaw or truss **220**, the user grasps handle **340** and lifts upwardly on the handle **340** to thus lift the shaft **320** upwardly, which causes the shaft **320** to move upwardly in the counterclockwise direction, as seen in FIG. **2**, to the extent permitted by the loose fit of pins **334** and **335** in the annular groove **324**. When threaded shaft **320** has pivoted free of threads **318** in threaded block **310** by such upward movement, the user pushes on handle **340** to move the shaft **320** toward pipe B. This pushing force is translated through shaft **320** to gripping head **330** which therefore advances until ridges **338** contact the surface of pipe B. During this movement, alignment bar **350** slides in alignment channel **112**, allowing gripping head **330** to translate in an essentially straight line toward pipe B while maintaining the gripping jaw ridges **338** in a substantially vertical position to provide a minimum four-point vertical contact with the pipe by the stationary jaw surfaces at points **222** and **224** and the movable jaw on at least two of the ridges **338**. As shown in FIG. **1**, at least four ridges **338** are provided, with their apexes designed to contact the surface of a pipe having the largest diameter for which the apparatus is designed, or six inches in the example given above. Then, two of ridges **338** will contact the surface of the smaller sized pipes. The force exerted by ridges **338** on the surface of pipe B urges pipe B into the interior substantially V-shaped contour of truss **220** and into intimate contact with serrations **221** at contact area **222** and **224**. Ridges **338**, like serrations **221**, can be coated with plastic or some other soft material to protect the surface of pipe B. When ridges **338** have forced pipe B into contact with serrations **221**, the user lowers handle **340**, causing threaded shaft **320** to pivot in a clockwise direction, as seen in FIG. **2**, about pins **334** and **335** until threads **322** mesh with threads **318**. It may be necessary to rotate threaded shaft **320** slightly in order to cause threads **322** to perfectly mesh with threads **318**. This rotation is accomplished by turning handle **340**.

After threads **322** have completely meshed with threads **318**, handle **340** is then turned farther, causing threaded shaft **320** to thread its way through threaded block **310**, applying additional force to gripping head **330** and thereby causing pipe B to be gripped more tightly between ridges **338** and serrations **221**. Pipe B will then be supported against vertical movement by the pipe B being gripped under pressure between gripping head **330** and stationary jaw **200**.

When it is desired to release pipe B from the device, the user turns handle **340**, usually only one or two turns, so as to cause threaded shaft **320** to thread its way back through threaded block **310** away from pipe B a sufficient distance to provide clearance for threaded shaft **320** to be lifted upwardly to pivot it about pins **334** and **335**. Handle **340** is then lifted, causing threaded shaft **320** to pivot in the counterclockwise direction as seen in FIG. **2**, thus providing a rapid release of the gripping force on the pipe B.

When threaded shaft **320** has pivoted sufficiently to remove threads **322** from threads **318**, the user pulls handle **340** and shaft **320** rapidly in the direction away from pipe B. When shoulder **327** of threaded shaft **320** contacts pins **334** and **335**, this pulling force is transmitted to gripping head **330**, pulling it away from pipe B. During this movement, alignment bar **350** slides in alignment channel **112**, again limiting gripping head **330** to linear translation to thereby maintain the vertical position of gripping head **330**. When gripping head **330** is completely free of contact with pipe B, the user lowers handle **340**, causing threaded shaft **320** to pivot in the clockwise direction, as seen in FIG. **2**, until threads **322** again mesh with threads **318**. The device is now configured to allow movement or replacement of pipe B.

Referring again to FIG. **1**, if it is desired to support pipe of a different diameter within the range of selected sizes of pipe, stationary jaw **200** is lifted until pins **214** are removed from holes **110**. Stationary jaw **200** is then relocated in either holes **110***a* or **110***b* according to the diameter of pipe to be supported. Stationary jaw **200** is then lowered onto base plate **100** thereby inserting pins **214** into the selected pair of holes **110***a* or **110***b*. Operation of gripping jaw **300** is the same as described above, regardless of the diameter of pipe being supported in the apparatus.

The preferred embodiment is described here as it is used to support pipe such as tubing in a well bore. This invention can also be used, however, to support such elongate members as drill rods, and its use need not be restricted to use with pipe in a well, as it could also be adapted for the vertical support of other elongate members.

The foregoing description of the device is only illustrative and explanatory thereof. Various other changes in the materials, apparatus, or method of use will occur to those skilled in the art. It is intended that all such variations within the scope and spirit of the appended claims be embraced thereby.

I claim:

1. A device for vertically suspending a tube in a well bore, comprising:

a base plate having a hole therethrough aligned with a well bore to allow the passage of a tube to be suspended in said well bore;

a gripping jaw;

a plurality of sets of jaw attachment means on said base plate spaced to enable selective placement of said jaw to accommodate a plurality of tubing diameters with at least one set of said attachment means on either side of said hole in said base plate;

said jaw having an internal substantially V-shaped gripping surface which is sized to provide two points of contact with said tube and which is releasably attached to said base plate by means of said attachment means on said base plate and is positioned to receive said tube in the interior of said gripping surface;

a gripping head slideably attached to said base plate which contacts said tube on the opposite side from said two points of contact between said gripping jaw and the tube to urge said tube into contact with said gripping jaw;

a threaded shaft pivotably connected at one end to said gripping head to apply force thereto in the direction toward said gripping jaw;

a threaded block on said base plate, having half threads which mesh with threads on said threaded shaft, through which said threaded shaft is screwed to apply force to said gripping head;

said half threads on said threaded block meshing with said threads on said threaded shaft around only about half of its circumference, allowing disengagement of said threads when said threaded shaft pivots about said end which is connected to said gripping head;

an alignment channel in said base plate the longitudinal axis of which is parallel to the central axis of said half threads; and

an alignment bar attached at one end to said gripping head, which slides in said alignment channel to restrict said gripping head to linear movement.

2. A device for vertically suspending a tube in a well bore, comprising:

a base plate having a bore hole therethrough aligned with a well bore, to allow the passage therethrough of a tube to be suspended in said well bore;

two rows of alignment holes on said base plate, parallel to a longitudinal axis of said base plate, one of said rows being on each side of said bore hole;

a pipe gripping jaw attached to said base plate by selectively engaging one hole in each of said rows of alignment holes so as to straddle said bore hole, said jaw having an internal substantially V-shaped gripping surface which is adapted to contact said tube at two points; said jaw being movable for selective positioning in the alignment holes to position the internal V-shaped gripping surface so as to contact tubes of various diameters at two points;

a gripping head slidably mounted on said base plate so as to slide along said longitudinal axis of said base plate to provide a three-point contact with said tube by said jaw and gripping head; and,

a threaded shaft pivotably mounted at one end to said gripping head so as to releasably engage threads on said base plate for forcing said gripping head against said tube.

* * * * *